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August 15, 1997

Mr. Peter Cowhey
Chief, International Bureau
Federal Communications Commission
2000 M Street, N.W., Room 830
Washington, D.C. 20554

Re: IB Docket 96-220
(NVNG MSS Proceeding)

Dear Mr. Cowhey:

Leo One USA Corporation ("Leo One USA"), by this letter, provides its views on this week's Little LEO settlement discussions. Leo One USA has been hopeful that as the issuance of a Report and Order approached, each of the pending Little LEO applicants would identify its true system requirements. Leo One USA believed that if each party articulated its true requirements, it may be possible to settle this proceeding.

In this regard, the discussions this week have yielded some results. Specifically, Orbcomm backed away from its request for 90 kHz of spectrum in the NOAA channels which the FCC identified in the Notice of Proposed Rulemaking as available for second round licensees. Orbcomm now states that it can implement its requested system modification in the downlink spectrum specified under its currently licensed channelization plan. Final Analysis now indicates that it could operate its downlink channels in the 137 MHz band. However, Final Analysis has stated that it also requires four downlink channels in the 400.505 - 400.645 MHz band in order to mitigate the perceived coordination risk of operating in the 137 - 138 MHz band and to preserve its so-called investment in subscriber equipment at 400 MHz. Leo One USA has stated that it needs access to the two DMSP channels in the 400 MHz band as well as one of the three non-DMSP 46.7 kHz channels in the 400.5050 - 400.6450 MHz band which would be used to hop to when both DMSP channels are blocked. This would allow Leo One USA to avoid shutting down its system and provide near real-time service. After further analysis, Leo One USA has agreed that it can accomplish this using only 35 kHz of a 46.7 kHz channel.

Leo One USA has consistently demonstrated throughout this proceeding that if it fails to obtain access to 35 kHz in one of the non-DMSP 400 MHz channels, it cannot implement its

proposed system. Without this spectrum, Leo One USA's system availability will significantly decline due to the requirements of time sharing with DMSP. Even a few percentage point decline in system availability will have a cliff effect, eliminating any ability to serve large numbers of markets which require near real-time service. For instance, the emergency services market cannot tolerate significant delay. If Leo One USA does not have a non-DMSP channel in the 400 MHz band, it will not be able to offer near real-time service and the potential emergency user will not subscribe to the Leo One USA system. This will prevent Leo One USA from serving most time-sensitive markets that are the core of its business plan, representing 60% of its projected total revenues. Under such circumstances Leo One USA could not proceed with the implementation of its proposed Little LEO system.

Leo One USA continues to believe that the existing downlink requirements of Final Analysis can be met in the currently allocated spectrum in the 137 MHz band. Specifically, Final Analysis could put the nine 15 kHz service links and three 35 kHz feederlinks specified in its pending application in the TIP and ATP channels in the 137 MHz band. Final Analysis argues that it wants access to the 400 MHz band because of the investment in subscriber equipment it has made in the 400 MHz band and the coordination risks inherent in the 137 MHz band. Close scrutiny of each argument raises serious questions regarding its validity. Specifically, it is impossible to believe Final Analysis' argument on investment in subscriber equipment at 400 MHz band given that as recently as March 1997 Final Analysis was prepared to place all subscriber links in the 137 MHz band. An historical examination of the record in this proceeding is quite revealing on this issue. For instance, Final Analysis' November 16, 1994 application sought nine remote terminal satellite downlink (RSD) and mobile terminal satellite downlink (MSD) subscriber channels in the 137-138 MHz band.[1] The February 24, 1995 Final Analysis amended application also specified nine RDS/MSD subscriber channels in the 137 MHz band.[2] The February 23, 1996 Final Analysis technical amendment[3] did not change this requirement and also specified nine RSD/MSD subscriber channel downlinks.[4] Each of these filings did indicate that gateway feeder links would be in the DMSP channels in the 400 MHz band. Final Analysis reiterated its request to place only feeder links in the 400 MHz band even after the Commission proposed in October 1996 to make 400 MHz spectrum available for service or feeder links. For instance, in its January 13, 1997 Reply Comments in this proceeding, Final Analysis concluded that it would not place *subscriber* links in the 400 MHz band:

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1 *See* Application of Final Analysis Communications Services, Inc. at II-10, Figure II-6, November 16, 1994 (copy attached).

2 *See* Application Amendment of Final Analysis Communications Services, Inc. at II, Figure II-6, February 24, 1995 (copy attached).

3 *See* Amendment of Final Analysis Communications Services, Inc., February 23, 1996.

4 *See* Application Amendment of Final Analysis Communications Services, Inc., at II-18, Figure II-6, February 23, 1996.

> the public interest would best be served by assigning [Final Analysis] spectrum in the 400-401 MHz downlink bands. Also, Final Analysis would favor an assignment plan pursuant to which this downlink spectrum was specifically available for *feeder* links.[5]

Use of the 137 MHz band by Final Analysis for service links was also implicit in its settlement proposal which was presented at the February 21, 1997 status conference. It was not until March 1997 after Leo One USA provided a comprehensive technical analysis of the X/Y plan demonstrating that the Leo One USA system could not operate its subscriber links in the 137 MHz band and maintain near real-time availability that Final Analysis indicated that it wanted to put service links in the 400 MHz band. Final Analysis noted in its March 24, 1997 *ex parte* filing that operation of feederlinks only in the 137 MHz band was necessary as a "solution [that] greatly reduces interference to GE Starsys to within acceptable levels." Leo One USA subsequently filed a technical analysis which was vetted and agreed to by GE Starsys that demonstrated how the Final Analysis system could operate both its service and feeder links in the 137 MHz band, meet its particular design objectives and still protect GE Starsys.[6] Furthermore, now that GE Starsys has returned its license, coordination with GE Starsys in the 137 MHz band is no longer relevant. And finally, even if some minor investment has been made any argument that such investment is unrecoverable cannot be supported.[7]

When all its hyperbole is stripped away, it becomes clear that there is no basis for Final Analysis' argument that it wants access to the 400 MHz band in order to recoup investment. It is hard to believe that Final Analysis made a decision to commit investment dollars and actually spent those dollars when it only decided in March 1997 to place its service links in the 400 MHz band. It would be foolhardy at best to make such an investment given the contentious nature of this proceeding and the uncertainty surrounding the second round band plan.

Regardless of whether Final Analysis actually has made any investment in subscriber equipment, Leo One USA notes that reliance on any such investment as the basis for the

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5 *See* Final Analysis Reply Comments at 40, January 13, 1997 (emphasis added).

6 *See Ex Parte* letter of Leo One USA, May 30, 1997.

7 For instance, although the antenna is different between the VHF and UHF bands, they are essentially the same design. Moreover, since the subscriber uplinks are in the VHF band it is likely that no change will be required in the antenna at all. The RF filters would change but this represents a very insignificant cost. The principal cost for subscriber equipment is the RF MMIC integrated circuits ("IC"). However, MMIC ICs are not band specific and can operate in the entire VHF and UHF bands. Thus, there would be no IC cost impact if Final Analysis operated in the 137 MHz band. No changes are required in the modulator/demodulator, digital processing and software to move from the UHF to VHF bands. Also, nonrecurring expense is insignificant to port UHF design to VHF. Finally, as the Commission is aware, subscriber equipment in the 137 MHz is readily available and can be purchased off-the-shelf from a number of potential vendors. Examples of VHF subscriber equipment and RF MMIC ICs which can operate over the VHF and UHF bands are attached hereto.

Commission's decision in this proceeding would contravene long standing Commission precedent and would set a dangerous policy for the future. The Commission has steadfastly refused to grant preferences based on investments made pursuant to anything less than a commercial license. The Commission has not hesitated to remind experimental licensees and recipients of 319(d) waivers that investments are made at their own peril.[8] Likewise, Final Analysis should not be allowed to bootstrap its way into the 400 MHz band because of a possible investment made prior to licensing.[9] Moreover, as the Commission is well aware, Leo One USA has made a significant financial and manpower investment in developing the means to make it possible for Little LEOs to consider use of the 137 MHz and 400 MHz band. This is an investment that may allow the Commission to resolve this proceeding and concomitantly benefit all Little LEO interests.

Final Analysis also contends that operation in the 137 MHz presents special coordination difficulties. Again a review of the facts demonstrates this conclusion is wrong. For instance, if Final Analysis uses the ATP and TIP channels it would need to coordinate with NOAA. Presumably, the coordination issues with NOAA in the 137 MHz band will be no more difficult than the coordination issues with the Air Force in the 400 MHz band. In fact, coordination with NOAA should be easier since the NOAA METSATs are not tactical military assets. Final Analysis would also be required to coordinate with E-SAT, but this should be relatively simple because E-SAT only will launch six satellites, and it plans to downlink to a single gateway located in Alaska. Finally, any concerns regarding coordination with GE Starsys have now disappeared. Thus, the facts demonstrate

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[8] The Commission has articulated a very straightforward policy on this issue. For example, in the case of GTE Airfone's air-ground telephone system, the Commission granted GTE Airfone experimental licenses with the understanding that it would not confer upon GTE Airfone any preferences:

> GTE was advised that grant of the [experimental license] application will not confer preferred status on GTE Airfone or in any way influence the outcome of the Commission's planned Rule Making on the 4 MHz. Rather, the outcome of the Commission's proceeding as to the best use of [this frequency] on a permanent basis will be dictated solely by the Commission's public interest standard. . . . [T]he Commission will not consider GTE Airfone's status as the incumbent user of this spectrum or the costs incurred by GTE Airfone in converting from its present use of [the bands]. *This is the case for any experimental authorization.*

2 FCC Rcd. 6830 (1987) at n. 60 (emphasis added). This position is the only reasonable application of Section 5.68 of the Commission's Rules. 47 C.F.R. §5.68 (for an experimental license, "the authority to use the frequency or frequencies assigned . . . does not confer any right to conduct an activity of a continuing nature").

[9] Leo One USA notes that the Bureau has very recently reiterated its views on the limited rights conveyed with an experimental license when it ordered Satellife, Inc. to terminate operation of its Healthsat II satellite upon launch of the VITASAT-1R satellite. If the public interest is not served by allowing a humanitarian non-profit operation to continue based on its investment in satellite hardware at a particular frequency, it is inconceivable that the Commission would find the public interest is served by advancing a commercial operation based solely on an investment in terminal equipment.

that coordination in the 137 MHz band should be no more difficult for Final Analysis (and may in fact be easier) than coordination in the 400 MHz band.

The decision now facing the Commission is whether it should accommodate Leo One USA's interest in implementing a near real-time system with reduced capacity from its original application or Final Analysis' desire to leverage its so-called investment. If the FCC chooses to accommodate Final Analysis in the 400 MHz band by assigning it use of the DMSP channels or all the non-DMSP channels, it will only have one appreciable result -- it will preclude Leo One USA from implementing its system in favor of accommodating Final Analysis' request to leverage off its so-called "investment."[10] This would be bad public policy and cannot be supported by the record in this proceeding. Most importantly it will deny the public access to new near real-time services. Final Analysis itself recognized that near real-time service is critical for a Little LEO operator when it concluded in its comments in this proceeding that "all market subsegments over time will tend towards near real-time solutions because all users will demand relatively immediate alerts of changes to conditions monitored.[11] However, Final Analysis believes that "the level of availability required for near real-time *is impossible to achieve* under the time sharing obligations proposed by the Commission in this proceeding."[12] (emphasis added) Thus, while both Leo One USA and Final Analysis agree that there are market demands for near real-time services, only Leo One USA is prepared to offer such services. To deny Leo One USA this opportunity would not serve the public interest, would wholly conflict with the record in this proceeding and cannot be judged to be the result of "reasoned decisionmaking."

As we have stated on numerous occasions since Leo One USA's application was filed in October 1993, Leo One USA is financially prepared to implement a near real-time Little LEO system in the existing allocations. All we seek is the opportunity to obtain a license from the Commission that allows us to do so. We therefore respectfully request that the Commission designate a license

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10 Leo One USA also notes Final Analysis' decision not to frequency hop would constitute a less efficient use of the 400 MHz band and would waste this valuable spectrum. Final Analysis has repeatedly stated that it will not frequency hop and that the approach is seriously flawed. On January 21, 1997 Final Analysis stated:

> The use of such a *frequency hopping approach* in the receiver portion of the user terminal is a strategy that has been espoused only by Leo One USA. Indeed, it is an approach *that Final Analysis expressly has stated that it will not use*. Final Analysis believes that the approach is seriously flawed from both a technical and business standpoint. It would have a serious deleterious impact on the cost of user terminals and the marketability of NVNG MSS services.

See Response of Final Analysis Communication Services, Inc. at 4 (emphasis added).

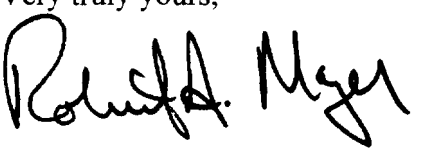
11 *See* Comments of Final Analysis in IB Docket 96-220 at 5, December 21, 1997.

12 *See* Reply Comments of Final Analysis in IB Docket No. 96-220 at 14, January 13, 1997.

in the 400 MHz band that will allow Leo One USA the opportunity to implement a near real-time system. This requires access to the two DMSP channels in the 400 MHz band and a single 35 kHz non-DMSP channel in the 400.5050 - 400.6450 MHz band.

As a final note, we would like to thank you and the entire staff for the dedication and commitment to this proceeding and the Little LEO industry that has been shown. Although this proceeding has been difficult, Leo One USA truly appreciates the significant efforts that have been made by the Commission to reach a successful conclusion to this proceeding.

Very truly yours,



Robert A. Mazer
Albert Shuldiner
Counsel for Leo One USA Corporation

cc: Parties of Record

Figure II-6. Requested Frequencies

Link	Frequency Band	Requested Frequencies	Total BW
RSU/MSU	148-150.05 MHZ	148.905-150.05 MHz*	1,145 KHz
RSD/MSD	137-138 MHz	137.3375-137.3625 MHz** 137.4875-137.5125 MHz** 137.6075-137.6325 MHz** 137.6325-137.6575 MHz 137.6575-137.6825 MHz 137.6825-137.7075 MHz 137.7075-137.7325 MHz 137.7325-137.7575 MHz 137.7575-137.7825 MHz**	225 KHz
GSU	148-150.05 MHz	149.25-149.30 MHz	50 KHz
GSD	400.15-401 MHz	400.380-400.430 MHz*** 400.520-400.570 MHz*** 400.595-400.645 MHz*** 400.720-400.770 MHz***	200 KHz

* FACS will not use 149.9-150.05 MHz until after January 1,1997.
** FACS will not use these band segments until after January 1, 2000.
*** Each satellite uses only one of these 50 KHz sub-bands.

3 dBi, while the gain at 90° elevation (zero degrees off nadir) is about -9.5 dBi. This results in near constant power flux density at a fixed point on the surface of the earth while the satellite travels across the sky (for minimum elevation of 5°). Separate antennae are included for the both the VHF transmit and receive functions. Additional antennae are included for the ground station UHF downlink and the L-Band GPS receiver.

Figure II-6. Requested Frequencies

Link	Frequency Band	Requested Frequencies	Total BW
RSU/MSU	148-150.05 MHZ	148.905-150.05 MHz*	1,145 KHz
RSD/MSD	137-138 MHz	137.318-137.333 MHz 137.4075-137.4225 MHz 137.4225-137.4375 MHz 137.4375-137.4525 MHz 137.4525-137.4675 MHz 137.4675-137.4825 MHz 137.5175-137.5325 MHz 137.5875-137.6025 MHz 137.6375-137.6525 MHz	135 KHz
GSU	148-150.05 MHz	149.95-150.00 MHz	50 KHz
GSD	400.15-401 MHz	400.380-400.430 MHz** 400.520-400.570 MHz** 400.720-400.770 MHz**	150 KHz

* FACS will not use 149.9-150.05 MHz until after January 1,1997.

** Each satellite uses only one of these 50 KHz sub-bands.

between 5° and 90° elevation angles.[5] For a 1000 km orbit the path loss difference is about 10.1 dB. A typical gain pattern is shown in Figure II-8. The gain at 5° elevation (about 60° off nadir) is 3 dBi, while the gain at 90° elevation (zero degrees off nadir) is about -7.1 dBi. This results in near constant power flux density at a fixed point on the surface of the earth while the satellite travels across the sky (for minimum elevation of 5°). Separate antennae are included for the both the VHF transmit and receive functions. Additional antennae are included for the ground station UHF downlink, the UHF uplink and the L-Band GPS receiver.

Figure II-6. Requested Frequencies

Link	Frequency Band	Requested Frequencies	Total BW
$(RSU/MSU)_1$	148-150.05 MHZ	148.905-150.05 MHz*	1,145 kHz
RSD/MSD	137-138 MHz	137.318-137.333 MHz 137.4075-137.4225 MHz 137.4225-137.4375 MHz 137.4375-137.4525 MHz 137.4525-137.4675 MHz 137.4675-137.4825 MHz 137.5175-137.5325 MHz 137.5875-137.6025 MHz 137.6375-137.6525 MHz	135 kHz
GSU_1	148-150.05 MHz	149.95-150.00 MHz	50 kHz
GSD	400.15-401 MHz	400.380-400.430 MHz** 400.520-400.570 MHz** 400.720-400.770 MHz**	150 kHz
$(RSU/MSU)_2$	450-460 MHz	455-456 MHz 459-460 MHz	2000 kHz
GSU_2	450-460 MHz	459.94-460.00 MHz	60 kHz

* Final Analysis will not use 149.9-150.05 MHz until after January 1,1997.
** Each satellite uses only one of these 50 KHz sub-bands.

[5] 5° elevation angle corresponds to the edge of coverage for the Final Analysis system.

NEC

1 V, 0.5 mA SILICON MMIC AMPLIFIER

UPC8102T

FEATURES

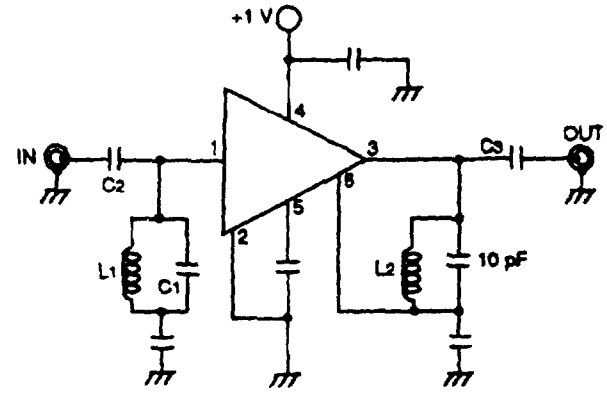
- **LOW VOLTAGE, LOW CURRENT:** 0.5 mA at 1 V
- **HIGH GAIN:** 19 dB at 150 MHz
- **LOW POWER CONSUMPTION:** 0.5 mW Typical
- **SUPER SMALL PACKAGE**
- **TAPE AND REEL PACKAGING OPTION AVAILABLE**

DESCRIPTION

The UPC8102T is a Silicon Monolithic Microwave Integrated Circuit which is manufactured using the NESAT III process. This process produces transistors with fT approaching 20 GHz. This amplifier was designed for operation at 1 volt, making it ideal for pager and other low voltage, low current applications.

NEC's stringent quality assurance and test procedures ensure the highest reliability and performance.

APPLICATION CIRCUITS



RECOMMENDED ELEMENT VALUES

f (MHz)		150	280
L_1	nH	56	22
C_1	pF	10	4.7
L_2	nH	68	22
C_2	pF	10	7.8
C_3	pF	3.9	2.2

Note: All unmarked capacitors are 1000 pF.

5

ELECTRICAL CHARACTERISTICS (T_A = 25° C, Z_S = Z_L = 50 Ω, V_{CC} = 1 V)

PART NUMBER PACKAGE OUTLINE			UPC8102T T06		
SYMBOL	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
I_{CC}	Circuit Current (no signal)	mA	0.30	0.50	0.65
G_S	Small Signal Gain[1], f = 150 MHz f = 280 MHz	dB dB	10	19 14	16.5
NF	Noise Figure[1], f = 150 MHz f = 280 MHz	dB dB		2.5 3.8	
R_{TH}	Thermal Resistance, Free Air Mounted[2]	°C/W °C/W			620 230

Notes:
1. External matching required. See application circuits.
2. Mounted on a 50 x 50 x 1.6 mm epoxy glass PWB.

NEC

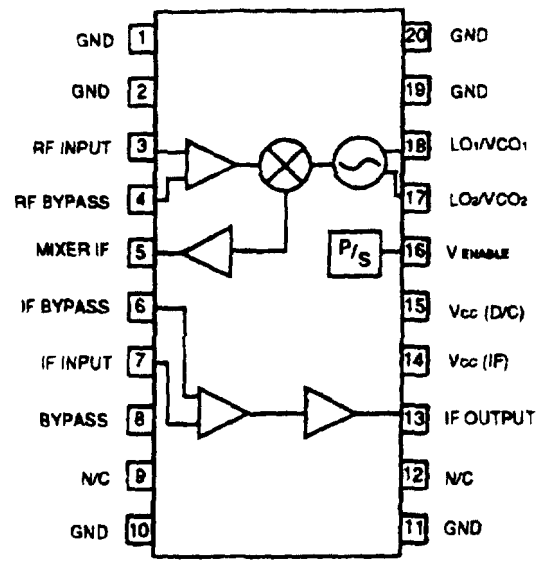
3V, 450 MHz SILICON MMIC FREQUENCY CONVERTER

UPC2768GR

FEATURES

- **LOW POWER DISSIPATION**
  V_{CC} = 3 V, I_{CC} = 7 mA
- **HIGH CONVERSION GAIN**
  80 dB
- **ON CHIP OSCILLATOR OR LO BUFFER:**
  DC - 450 MHz
- **OUTPUT LIMITING**
  450 mVp-p
- **BROADBAND OPERATION**
  DC - 450 MHz
- **POWER SAVE FUNCTION**
  I_{CC} (ps) = <100 µA

INTERNAL BLOCK DIAGRAM



DESCRIPTION

The UPC2768GR is a frequency converter manufactured with the NESAT III process. This product consists of an RF input amplifier, Gilbert cell mixer, Local Oscillator or LO buffer, IF amplifier, external filter port, and IF output limiting amplifier. The on-chip local oscillator only requires an external tank circuit. The power save feature enables users to minimize overall current consumption when dormant. This device was specifically designed for low-cost second IF receivers, keyless entry applications, security systems, GPS, and other low power Part 15 mobile radios.

5

ELECTRICAL CHARACTERISTICS (V_{CC} = 3.0 V, T_A = 25°C, Z_L = Z_S = 50 Ω, V_{ENABLE} ≥ 2.5 V unless otherwise specified)

	PART NUMBER PACKAGE OUTLINE			UPC2768GR S20 (SSOP 20)		
	SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
	I_{CC}	Circuit Current (V_{ENABLE} ≥ 2.5 V)[4] (V_{ENABLE} ≤ 0.5 V)	mA µA		7	 100
Down Converter	f_{RF}, f_{LO}	RF and LO Input Frequency Range (3 dB BW)[1], f_{IF} = 10 MHz	MHz	DC		450
Down Converter	CG	Conversion Gain[2], f_{RF} = 433 MHz, f_{IF} = 25 MHz	dB	33	36	40
Down Converter	NF	Noise Figure[2], f_{RF} = 450 MHz, f_{IF} = 10 MHz	dB		12	
Down Converter	$Leak_{LO-RF}$	LO to RF Leakage[3], f_{LO} = 1 to 450 MHz	dBm		-62	
Down Converter	$Leak_{LO-IF}$	LO to IF Leakage[3], f_{LO} = 1 to 450 MHz	dBm		-25	
IF Amplifier	G_S	IF Amplifier Small Signal Gain f_{IF} = 10.7 MHz f_{IF} = 25.0 MHz	dB dB	40 38	44 42	47 45
IF Amplifier	V_{OUT}	Limiting Output Voltage, Z_L = 2KΩ, f_{IF} = 10 MHz	mVp-p		450	
IF Amplifier	P_{SAT}	Saturated Output Power	dBm		-20	

Notes:
1. Conversion Gain is -3 dB from Conversion Gain for f = 50 MHz.
2. Down converter only (RF_{IN} to mixer IF_{OUT}).
3. P_{LO} = -10 dBm external, or using internal LO.
4. Down converter and IF amp may be operated separately. Typical I_{CC} for down converter is 5.5 mA (pin 15). Typical I_{CC} for IF amp is 1.4 mA (pin 14).

NEC

WIDEBAND IQ DEMODULATOR FOR DIGITAL RECEIVERS

UPC2766GR

FEATURES

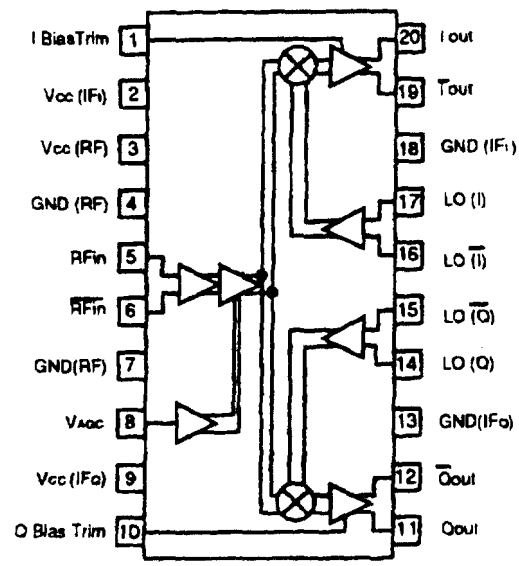
- **BROADBAND OPERATION**
  RF & LO DC to 1 GHz
  IF (IQ) DC to 100 MHz
- **WIDEBAND IQ PHASE AND AMPLITUDE MATCHING**
  Amplitude Matching: ±0.3 dB Typical
  Phase Matching: ±0.3° (driven in phase)
- **AGC DYNAMIC RANGE:**
  35 dB Typical
- **LOW DISTORTION:**
  30 dBc Typical
- **SMALL SSOP 20 PACKAGE**
- **TAPE AND REEL PACKAGING AVAILABLE**

DESCRIPTION

The UPC2766GR Silicon MMIC Wideband IQ Demodulator was manufactured with the NESAT III MMIC process. The NESAT III process produces transistors with fT approaching 20 GHz. The device was designed specifically for digital video and data receivers. The IC consists of a wide band RF amplifier, Gain Control amplifier, dual balanced mixers, LO buffers, and I & Q output buffer amplifiers.

NEC's stringent quality assurance and test procedures ensure the highest reliability and performance.

FUNCTIONAL BLOCK DIAGRAM



ELECTRICAL CHARACTERISTICS[1] (T_A = 25°C, V_{CC} = 5 V)

	PART NUMBER PACKAGE OUTLINE		UPC2766GR S20 (SSOP 20)		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
I_{CC}	Circuit Current (no signal)	mA		60	78
f_{RF}	RF Input Bandwidth[2] f_{IF} = 40 MHz, $f_{RF} > f_{LO}$, 3 dB down	MHz	DC-750	DC-1000	
f_{IF}	IF Output Bandwidth[3] f_{RF} = 480 MHz, $f_{RF} > f_{LO}$, 3 dB down, V_{AGC} = 0 V	MHz	DC-50	DC-100	
CG	Conversion Gain	dB	15	20	25
NF	Noise Figure	dB		24	
IM3	3rd Order Intermodulation Distortion f_{RF1} = 480 MHz, f_{RF2} = 490 MHz, f_{LO} = 440 MHz, P_{IN} = -20 dBm, V_{AGC} = 1 V	dBc		30	
$\Delta\Phi$	IQ Phase Balance (LO driven in phase)	deg		±0.3	±1.5
ΔG	IQ Amplitude Balance	dB		±0.3	±0.5
G_{AGC}	AGC Range, V_{AGC} = 0-5 V	dB	30	35	
LO-RF	LO to RF Isolation	dB		40	
LO-IF	LO to IF Isolation	dB		10	
P_{SAT}	Saturated Output Level	dBm		+2	
V_O	Saturated Output Voltage (Z_L = 250 Ω//2pF)	V_{P-P}	1.2	1.5	

Notes:

1. f_{RF} = 480 MHz, f_{IF} = 40 MHz, P_{LO} = -10 dBm, P_{RF} = -30 dBm, V_{AGC} = 0 V, $f_{RF} > f_{LO}$ unless otherwise specified.
2. RF Bandwidth defined as 3 dB down from response at f_{RF} = 40 MHz.
3. IF Bandwidth defined as 3 dB down from response at f_{IF} = 10 MHz.

19-0425; Rev 0; 8/95

EVALUATION KIT AVAILABLE

MAXIM

3V, Ultra-Low-Power Quadrature Modulator

MAX2452

General Description

The monolithic MAX2452 is a quadrature modulator with supporting oscillator and divide-by-8 prescaler. It operates from a single +3V supply and draws only 4.1mA. The modulator accepts differential I and Q baseband signals with amplitudes up to 1.35Vp-p and bandwidths up to 15MHz. It produces a differential output up to 80MHz.

Pulling the CMOS-compatible ENABLE pin low reduces the supply current to 2µA. To minimize spurious feedback, the MAX2452's internal oscillator is set at twice the IF via external tuning components. The oscillator and associated phase shifters produce differential signals exhibiting low amplitude and phase imbalance, yielding 42dB sideband rejection. The MAX2452 comes in a 16-pin narrow SO package.

Applications

Digital Cordless Phones

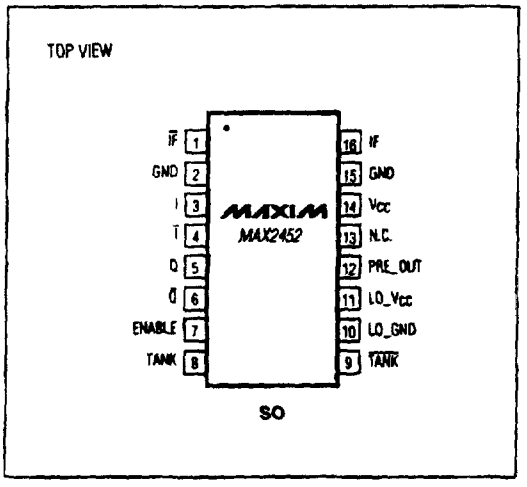
GSM and North American Cellular Phones

Wireless LANs

Digital Communications

Two-Way Pagers

Pin Configuration



Features

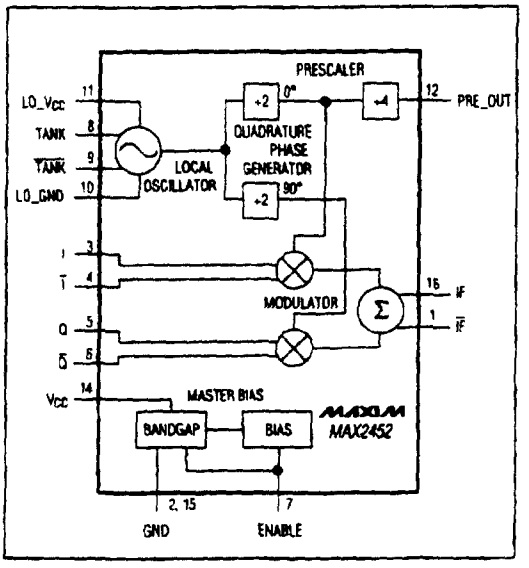
- ♦ **IF Output Frequency up to 80MHz**
- ♦ **Input Bandwidth up to 15MHz**
- ♦ **On-Chip Oscillator with External Tuning Circuit**
- ♦ **On-Chip Divide-by-8 Prescaler**
- ♦ **Integrated Quadrature Phase Shifters**
- ♦ **Self-Biased Differential Baseband Inputs**
- ♦ **CMOS-Compatible Enable**
- ♦ **4.1mA Operating Supply Current**
  2µA Shutdown Supply Current

Ordering Information

PART	TEMP. RANGE	PIN-PACKAGE
MAX2452ISE*	-20°C to +85°C	16 Narrow SO

** An alternate marking, MAX2452CSE, has been identically tested.*

Functional Diagram



NEC

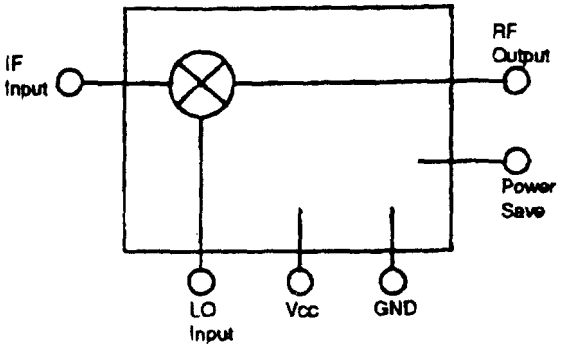
3 V, SILICON MMIC FREQUENCY UP-CONVERTER

UPC8106T UPC8109T

FEATURES

- **WIDE BAND OPERATION:**
  IF Input: 3 dB BW: 50 ~ 400 MHz Typical
  RF Output: 3 dB BW: 0.1~2 GHz Typical
- **LOW VOLTAGE OPERATION:** 2.7 V Minimum
- **LOW POWER CONSUMPTION:** 15 mW (UPC8109T)
- **POWER SAVE FUNCTION**
- **SUPER SMALL PACKAGE**
- **TAPE AND REEL PACKAGING OPTION AVAILABLE**

INTERNAL BLOCK DIAGRAM



DESCRIPTION

The UPC8106T and UPC8109T are L-Band Frequency Up-Converters manufactured using the NESAT III MMIC process. The UPC8106T was designed for low distortion while the UPC8109T was designed for low current consumption. Operation from a 3 volt supply voltage makes this device ideal for handheld cellular, PCN and wireless LAN applications.

NEC's stringent quality assurance and test procedures ensure the highest reliability and performance.

5

ELECTRICAL CHARACTERISTICS (T_A = 25°C, V_{CC} = 3 V, f_{IF} = 240 MHz, P_{LO} = -5 dBm, V_{PS} ≥ 2.5V)

PART NUMBER PACKAGE OUTLINE			UPC8106T T06			UPC8109T T06		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX
I_{CC}	Circuit Current, V_{PS} ≥2.5 V V_{PS} = 0 V	mA μA	4.5	9	13.5 10	2.5	5	8
CG	Conversion Gain[1], f_{RF} = 900 MHz f_{RF} = 1.9 GHz	dB dB	7 4	10 7	13 10	4 2	7 5	10 8
NF	Single Standard Noise Figure, f_{RF} = 900 MHz	dB		8.5			8.5	
P_{SAT}	Saturated Output Power[2], f_{RF} = 900 MHz f_{RF} = 1.9 GHz	dBm dBm	-4 -6.5	-2 -4		-7.5 -10	-6 -8	
IP_3	Output 3rd Order Intercept Point[3], f_{RF} = 900, 900.4 MHz f_{RF} = 1.9, 1.9004 GHz	 dBm dBm		 +7 +6.5			 +5 +1.5	
$R_{TH(J-A)}$	Thermal Resistance (Junction to Ambient) Free Air Mounted on a 50 x 50 x 1.6 mm epoxy glass PWB	 °C/W °C/W			 620 230			 620 230

Notes:
1. P_{IF} = -30 dBm.
2. P_{IF} = -10 dBm.
3. f_{IF1} = 240.0 MHz, f_{IF2} = 240.4 MHz

Jobcom portable radios are available in VHF & UHF, 1, 2 or 3 watt with 1 or 2 channel capacity. Each model offers a variety of audio accessories to meet your specific communication needs. All models are offered at an affordable price and include crystals on CH-1, flexible antenna, nickel cadmium battery, wall-type charger and one year warranty.

RT-15C

RT-15C/B	VHF, 154.570 MHz, 1 watt, 1 channel	189.75
RT-15C/G	VHF, 154.600 MHz, 1 watt, 1 channel	199.75
RT-15C/R*	VHF, 151.625 MHz, 1 watt, 1 channel	199.75
RT-15C	Special frequency (additional crystal charge required)	199.75

RT-15H - VOX/PTT - includes RHD-10 headset, built-in VOX/PTT module, audio jack

RT-15H/B	VHF, 154.570 MHz, 1 watt, 1 channel	249.75
RT-15H/G	VHF, 154.600 MHz, 1 watt, 1 channel	249.75
RT-15H/R*	VHF, 151.625 MHz, 1 watt, 1 channel	249.75
RT-15H	Special frequency (additional crystal charge required)	249.75
JC23A	OPTION: delete RHD-10 headset from package, add RHD-23 headset (double earmuff)	138.00

RT-15D - PLUS - includes channel selector switch, audio jack

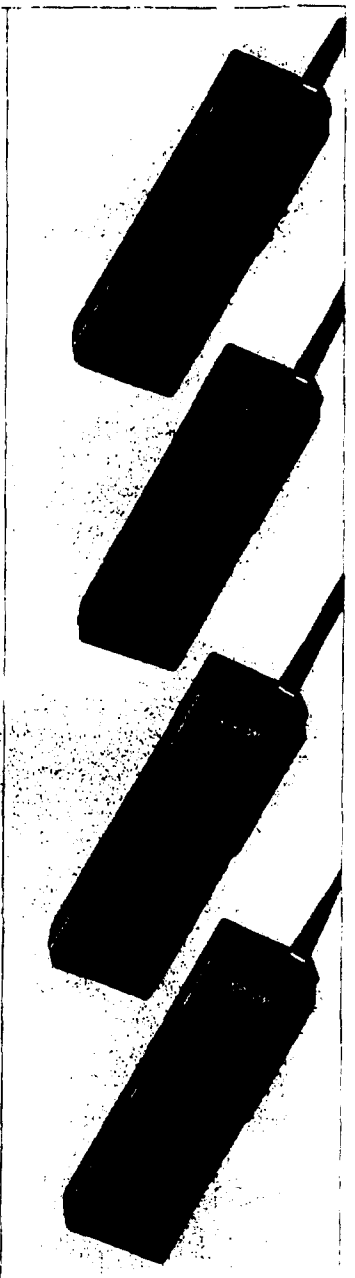
RT-15D	VHF, CH-1, 154.570, CH-2, 154.600, 2 wt	299.75
RT-15D/B	VHF, CH-1, 154.570, CH-2 blank, 2 wt	299.75
RT-15D/G	VHF, CH-1 154.600, CH-2 blank, 2 wt	299.75

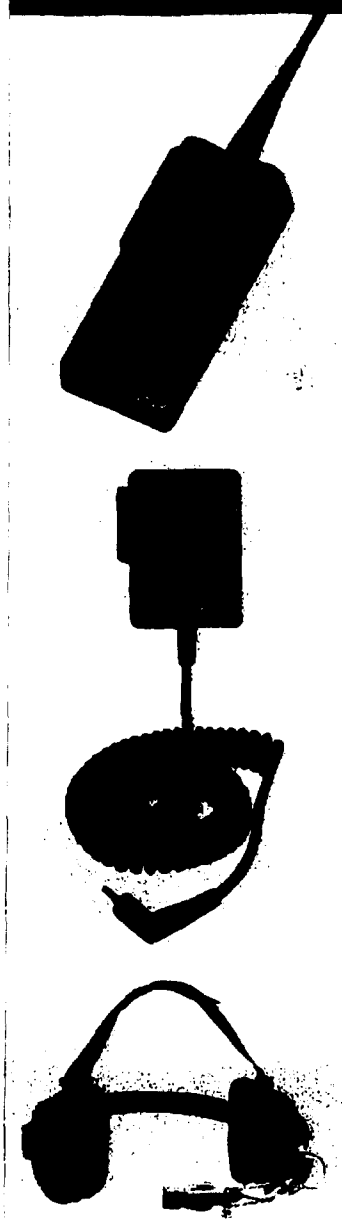
RT-453 - includes channel selector switch, audio jack

RT-453/W**	UHF, CH-1, 462.575, CH-2 blank, 3 wt	249.75
RT-453/BL**	UHF, CH-1, 462.625, CH-2 blank, 3 wt	249.75
RT-453/O**	UHF, CH-1, 462.675, CH-2 blank, 3 wt	249.75
RT-453/BR*	UHF, CH-1, 464.500, CH-2 blank, 3 wt	249.75
RT-453/Y*	UHF, CH-1, 464.550, CH-2 blank, 3 wt	249.75
RT-453	UHF, Special frequency, CH-1 included, CH-2 blank, 3 wt	249.75

*Itinerant frequency - for commercial activity for operation at unspecified job locations.

**GMRS - General Mobile Radio Service - personal use only, non-commercial activity.





1-800-527-1670
Fax: 214-349-8950
or Call Your Local Branch Office Listed on Back Cover

JMX-150/450 Sub-Miniature Synthesized Portables

JMX-150	VHF, 151-155 MHz, 2 watt, 2 channel, CTCSS, weather scan	329.75
JMX-450	UHF, 460-470 MHz, 2 watt, 2 talkaround channels, CTCSS	349.75

Crystal/Audio Signaling:

JC-CRY	Crystal, two each per channel required	15.00
RTS-2P	CTCSS tone module, RT-15	64.00
RTS-4P	CTCSS tone module, RT-453	74.00
RPQC-2	CTCSS tone and two-tone sequential module for RT-15 models	99.00

Antennas:

AF-150	VHF flexible antenna	15.00
AF-450	UHF flexible antenna	15.00
AF-450S	UHF stubby antenna	15.00

Batteries & Chargers:

BP-5NM	Battery pack, RT-15C, RT-15H	30.00
BP-6NM	Battery pack, RT-15D	35.00
BP-7NM	Battery pack, RT-453	40.00
BC-A	Wall charger for RT-15 & JMX models	9.75
BC-AR	Wall charger, RT-453	15.75
CCL-B	Vehicular mobile charger	14.75
PC01	Charger tester for the BC-A	18.75

Microphone/Headsets:

ERPH	Earphone/RT models	5.00
REP-2	Earphone - JMX	12.00
RSM-23	Speaker/mic - RT-15D	35.00
RSM-2X	Speaker/Microphone with PTT - JMX	46.00
RHD-10	Headset, single earpad, RT-15H, RT-15D	21.75
RHD-1X	Single ear headset with PTT	30.00
RHD-23	Headset, double earmuff, RT-15H, RT-15D	159.75

Carrying Devices:

CB-A	Belt clip	10.75
MH-A	Leather holster w/belt loop and rain shield	24.75
MMB-A	Vehicular mount bracket	21.75

Mobile Antennas:

RAM-10	VHF magnetic mount	39.75
RAM-11	UHF magnetic mount	39.75
AAD-8	Antenna adapter, converts portable to external mobile/base antenna, PL-259 female	11.95

30 F30/F40 Series Portables by ICOM

All F30/40 Series: Synthesized PC programmable VHF and UHF portables • 16 channels • Rugged construction, die-cast aluminum frame, polycarbonate casing • 1400 mAH Ni-Cd battery standard (over 8 hours typical operating time 5-5-90) • CTCSS and DTCS standard • Programmable power per channel (1, 2, 5 Watt) • 3 programmable switches • MIL spec STC-810C, D • 2-tone decode paging option (UT-80) • **All Models FM Approved** Intrinsically safe I, II, III, Division I Groups C, D, E, F, Y (with CM-141 battery) • 4 scan lists including priority scan • **Radios include:** battery, flexible antenna, mic connector, belt clip, operators manual, 2 year limited factory warranty • Available with trickle charger, or a rapid charger package with very affordable prices.

F30 VHF Portable

F30 01	136-150 MHz, IS	669.00
F30 02	146-174 MHz, IS	669.00

F40 UHF Portable

F40 01	400-430 MHz, IS	689.00
F40 02	430-470 MHz, IS	689.00

F30LT/F40LT Additional Features:
• 96 Channel • 8 Character Alpha LCD • Keypad Programmable • 7 programmable switches • DTMF A.N.I.

F30LT VHF Portable

F30LT 11	136-150 MHz, IS	769.00
F30LT 12	146-174 MHz, IS	768.00

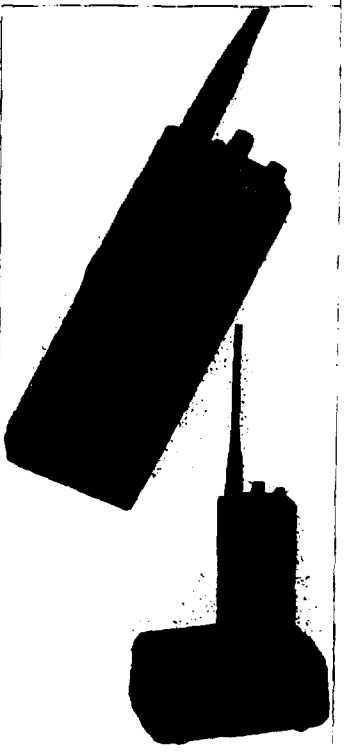
F40LT UHF Portable

F40LT	400-430 MHz, IS	788.00
F40LT 12	430-470 MHz, IS	788.00
F40LT 13	470-512 MHz, IS	788.00

RADIOS ARE SUPPLIED LESS CHARGER. MANY CHARGERS ARE AVAILABLE. CALL FOR SPECIFIC CHARGER PRICING.

Options: Accessories

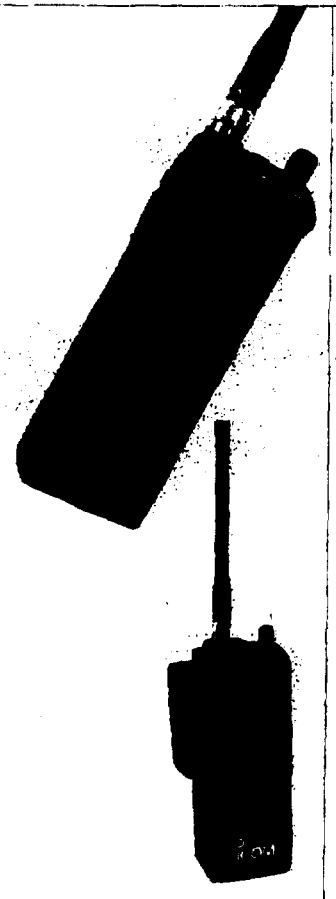
8900883	BNC Female Connector/ Adapter	16.11
8000872	Mic Cord for Acc. or EM-81	37.14
AD-67	Adapter for BC-119 01	10.00
BC-119 01	Rapid charger (AD-67 required) (will replace BM-96U)	80.00
BM-97U	Drop-in trickle charger	54.00
CM-140	7.2v, 1400 mAH, Ni-Cd Battery Packet	82.80
CM-141	7.2v, 1400 mAH, I/S Ni-Cd Battery Packet	82.00
CM-142	7.2v, 1400 mAH, Ni-Mh Battery Packet	92.00
CP-1	7.2v, Cigarette lighter plug-in adapter use w/MB-54	25.00
EM-81	Speaker Microphone	88.00
FA-SC24U	UHF Antenna, 400-430 MHz	26.00
FA-SC56U	UHF Antenna, 430-470 MHz	26.00
FA-SC24V	VHF Antenna, 136-150 MHz	28.00
FA-SC54V	VHF Antenna, 146-174 MHz	28.00
FC-SC71U	UHF Antenna, 470-512 Mhz	28.00



LC-S30	Leather Case for F30/F40	36.50
MB-54	Vehicle charger mounting bracket (BM-96/BM-97) use w/CP-1 (12v adapter)	50.00
NC-S38	Nylon Case for F30/F40	31.00
EX-1489-98	PC Programming Software	56.00
OPC-427	Cloning Cable, PC to portable	65.00
OPC-444	Cloning Cable, portable to portable	65.00
UT-80	2-Tone decode module	33.00
UT-82	DTMF keypad, 4 additional programmable keys, memory DTMF	68.00
SVC-F30/40	Service Manual	31.00
SVC-F30L/40L	Service Manual	31.00

F10/F20 Series Portables by ICOM 31

All F10/F20 Series: Synthesized PC programmable VHF and UHF portables • CTCSS standard and DTCS option • 2-tone decode paging optional (can not have DTCSS and 2-tone installed simultaneously) • 24 programmable frequency channels • 8 character LCD display • Up to 10 customizeable function keys • Programmable scanning • **All versions and packages include:** Ni-Cd battery, Flexible antenna, Belt clip, wrist strap and 2 year limited factory warranty. Radio is sold in a 2 watt (BP-160) or a 4 watt (BP-174) version available with Tricklecharger, or a rapid charger package with very affordable prices.



VHF Portables

F10 01	145-174 MHz, W/BP-160, 2 watt	450.00
F10 24	146-174 MHz, W/BP-174, 4 watt	485.00
F10 02	136-150 MHz, W/BP-160, 2 watt	450.00
F10 25	136-150 MHz, W/BP-174, 4 watt	485.00

UHF Portables

F20 01	400-430 MHz, W/BP-160, 2 watt	518.00
F20 01HP	400-430 MHz, W/BP-174, 4 watt	558.00
F20 02	440-470 MHz, W/BP-160, 2 watt	518.00
F20 02HP	440-470 MHz, W/BP-174, 4 watt	558.00
F20 03	470-490 MHz, W/BP-160, 2 watt	518.00
F20 03HP	470-490 MHz, W/BP-174, 4 watt	560.00
F20 04	490-520 MHz, W/BP-160, 2 watt	518.00
F20 04HP	490-520 MHz, W/BP-174, 4 watt	560.00

RADIOS ARE SUPPLIED LESS CHARGER. MANY CHARGERS ARE AVAILABLE. CALL FOR SPECIFIC CHARGER PRICING.

Options: Accessories

AD-66	Adapter for BC-119 01	14.00
AD-54	Desktop trickle charger - use w/ BC-113U	35.00
BC-119 01	Rapid charger (w/AD-66)	80.00
BM-113U	AC adapter for AD-54	28.00
BP-130A	"AA" Alkaline battery case	28.00
BP-157A	7.2v, 900 mAH battery	68.00

Ant charger

FA-[illegible]T	Flexible Antenna-UHF 440-470 mHZ	28.80
FA-136T	Flexible Antenna-VHF 136-150 mHZ	24.00
FA-156T	Flexible Antenna-VHF 146-174 mHZ	26.00
EX-1009	F10/F20 programming software	48.00
OPC-478	PC programming cable	45.00
OPC-474	Portable to Portable cloning cable	18.00
OPC-534	Multi-charger adapter cable for AD-54	9.00
UT-96	5-Tone unit (mainly European applications)	58.00
SVC-F10/20	Service Manual	31.00

53.00
78.00
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The **GR300** is a compact, portable repeater system that provides the flexibility to meet the frequency/power level requirements in a wide variety of applications. The **GR300** increases the range and capabilities of your mobile and portable communications. The standard model includes: metal enclosure with temperature controlled fan, power supply with switchable primary voltage, and a complete set of cables. The **GR300** requires the addition of 2 Radius mobile radios, a duplexer (available in all sub-bands) and a repeater controller.

Housing Package: (Housing, power supply, fan & cables)

HLN3052	GR300 Desktop/Portable housing package	**399.00**

Repeater Controllers: *cables w/housing pkg.*

HLN3948	Basic interface repeater controller	**249.00**
HLN9004	i50R basic interconnect repeater controller	**525.00**
HLN9119	ZR340 advanced interconnect repeater controller	**675.00**
HLN8388	ZR310 multiple tone community repeater controller	**775.00**
HLN8389	ZR320 selective-calling interconnect repeater controller	**950.00**
HLN8390	ZR330 radio/telephone interface module	**810.00**
HLN9121	TRA100R tone remote adapter repeater controller	**675.00**

Duplexers: Except as noted, all duplexers require tuning in the field.

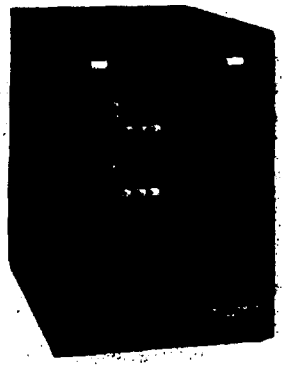
TDN7407	UHF Duplexer, 450-470 MHz, specify freq. for factory tuning	**354.00**

Other duplexers are available in both VHF and UHF frequencies.

Preselectors: *specify frequency for factory tuning*

HFE8459	UHF Preselector, 440-474 MHz	**305.00**

Other preselectors are available in both VHF and UHF frequencies.



General Accessories:

HPN8983	Power supply	**149.00**
HLN9136	Battery revert/float maintenance charger	**119.00**
HSN8145	7.5W external speaker	**43.00**
HLN9673	Shorting plug for microphone jack	**8.00**
HLN8449	Front & back enclosures with carry handles	**110.00**
HLN9286	19" panel mount adapter	**199.00**
TDN8300	DC Remote adapter & service manual - 2 channel operation only compatible w/16 channel GM300 (order desktop controller separately)	**430.00**
TDN8301	Tone Remote adapter & service manual - 2 channel operation only compatible w/16 channel GM300 (order desktop controller separately)	**530.00**

The Motorola **R*I*C*K (Repeater Interface Communications Kit)** is a repeater controller that provides repeater functionality by linking the transmit radio and the receive radio. The R*I*C*K adds features that expand the repeater system to meet the user's needs.

Repeater Interface Communications Kit: (includes selectable hang time, PL, DPL, COS, uni-directional or bi-directional operation, singleband and crossband operation, transparent operation, and manual)

HLN3333	R*I*C*K	**299.00**

Accessories:

HLN9969	Additional cable kit - 16 conductor cables - 3' long- for connection to other accessories	**22.00**

Service Manuals:

68-80901Z79-B	R.I.C.K. Service / Programming manual	**5.00**

1-800-527-1670
Fax: 214-349-8950
or Call Your Local Branch Office Listed on Back Cover

CP-0500 SERIES 4 channel capacity, crystal controlled portable radio, 5 watts power output, CH-1 crystals included, flexible antenna, nickel cadmium battery, audio connector, AC wall-type charger (10 to 14 hour), belt clip, protective sleeve and one year warranty.

CP-0510	VHF	**279.75**
CP-0520	UHF	**299.75**

SL-500 SERIES 99 channel portable radio, 5 watts output, top-mounted LCD display, up/down channel selector, user selectable features, accessory connector, die-cast aluminum cabinet. Includes: flexible antenna, nickel cadmium battery, drop-in desktop charger, belt clip, and one year warranty.

SL-500V	VHF	**279.75**
SL-500U	UHF	**299.75**

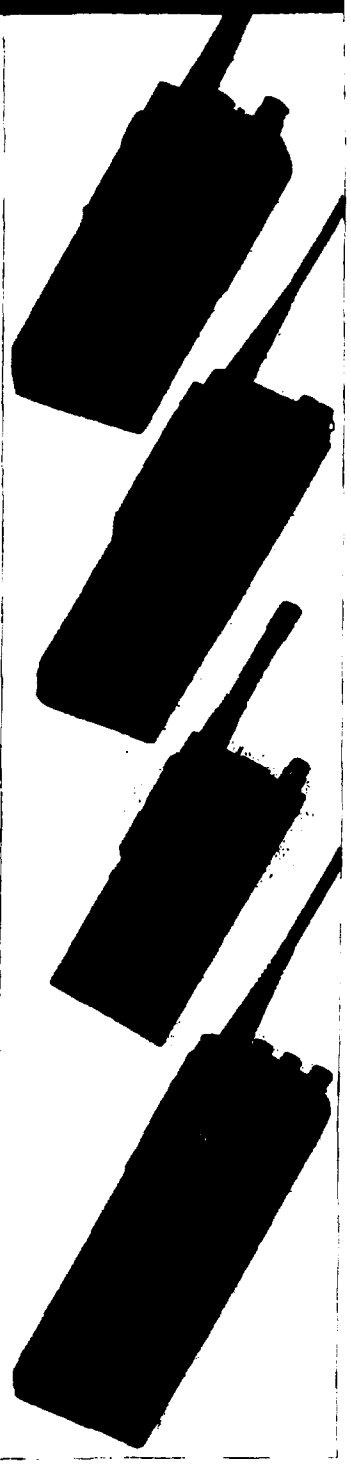
GMRS-21A 2 channel, 1 watt, UHF portable radio. This mini-portable features a channel selector switch with two built-in channels operating and an audio accessory jack is provided. Each unit includes slide on 450 mAH nickel cadmium rechargeable battery, AC/DC wall charger, belt clip, rubber duck antenna and one year warranty.

GMRS-21A	UHF, 1wt, 2 ch, *Ch A- 462.575 MHz *Ch B- 462.625 MHz	**199.75**

GMRS-210+3 10 UHF channels: 2 dealer programmable channels, one channel set aside by FCC for emergency and safety communications and 7 non-programmable channels set on existing GMRS frequencies. 2 watts RF power, up to 5 watts with included vehicular DC power cord. Each unit includes: flexible antenna, rechargeable Ni-Cad battery, 12V vehicular DC power cord, AC/DC wall charger, belt clip, hand strap, owner's manual, FCC license application.

GMRS-210+3	UHF, 2wt, 10 ch.	**249.75**

*GMRS - General Mobile Radio Service - personal use only, non- commercial activity.



Radius SP50 Portable by Motorola

The **SP50** offers flexibility usually associated with more cumbersome and expensive units. The **SP50** is a low cost alternative for customers who need two-way radio communications with capabilities that set it apart from the competition: Synthesized circuitry - fully programmable; Multi-channel - available in 2, 6, and 10 channel models; scan, high/low power, or tight/loose squelch; variable power - per channel on all models. The **SP50** comes in two models, compact and standard. Compact model includes belt clip, low capacity battery, 10 hr. wall charger, antenna, and user guide. Standard model includes spring action belt clip, high capacity battery, 10 hr. desktop charger, antenna, and user guide. Both models have a one year warranty with an option for ESP.

Compact- 2 channel only- 20/25/30 kHz

VHF

P93YQS20A2-A	VHF, 1-5wt, 2ch, 150-170MHz	**438.00**

UHF

P94YQS20A2-A	UHF, 1-4wt, 2ch, 450-470MHz	**470.00**

Standard- 2, 6 & 10 channel -20/25/30 kHz

VHF

P93YQT20A2-A	VHF, 1-5wt, 2ch, 150-170MHz	**475.00**
P93YQT20B2-A	VHF, 1-5wt, 6ch, 150-170MHz	**565.00**
P93YQT20G2-A	VHF, 1-5wt, 10ch, 150-170MHz	**629.00**

UHF

P94YQT20A2-A	UHF, 1-4wt, 2ch, 450-470MHz	**515.00**
P94YQT20B2-A	UHF, 1-4wt, 6ch, 450-470MHz	**605.00**
P94YQT20G2-A	UHF, 1-4wt, 10ch, 450-470MHz	**668.00**

OPTIONS:

(added to portables at time of order)

H437B	3 hr. Rapid Charger, (omit drop-in charger)	**30.00**
H437C	3 hr. Rapid Charger (omit wall charger)	**49.00**
H885F	2 year Express Service Plus (ESP) plan	**29.00**

12.5 kHz Models Available Soon

BEARCOM
Wireless Worldwide

1-800-527-1670
Fax: 214-349-8950
or Call Your Local Branch Office Listed on Back Cover

Batteries & Chargers:

HNN9018	1200 mAH high capacity battery (**Standard model only**)	**45.00**
HNN9044	650 mAH low capacity battery (**Compact model only**)	**35.00**
HTN8232	Wall charging adapter	**6.00**
HTN9013	3 Hr. Desktop charger	**56.00**
HTN9014	10 Hr. Desktop charger	**25.00**
HTN9057	Six unit- 3 Hr. charger	**445.00**

Antennas:

NAD6502	VHF flexible antenna 146-174 MHz	**11.00**
HAD9742	VHF stubby antenna 146-162 MHz	**10.00**
HAD9743	VHF stubby antenna 162-174 MHz	**10.00**
NAE6483	UHF flexible antenna 403-520 MHz	**11.00**
NAE6522	UHF stubby antenna 438-470 MHz	**10.00**

Carrying Cases for Compact (C) and Standard (S) Models:

HLN9122	Hard leather carry case w/beltloop (C)	**35.00**
HLN9125	Hard leather carry case w/beltloop (S)	**35.00**
HLN9126	Nylon carry case w/beltloop (S)	**24.00**
HLN9127	Nylon carry case w/beltloop (C)	**24.00**
HLN9128	DTMF leather carry case w/swivel (C) (S)	**40.00**
HLN9129	Hard leather carry case w/swivel (C) (S)	**40.00**
HLN9724	2-1/2" belt clip	**3.00**
HLN8255	3" Spring clip	**6.00**
HLN9149	Swivel belt loop adapter	**8.00**
HLN9985	Waterproof bag	**36.00**

Audio & Signaling:

HMN9725	Remote speaker microphone	**70.00**
HMN9787	L/W headset with swivel boom microphone (w/o VOX)	**64.00**
HMN9013	L/W headset with swivel boom microphone (w/o VOX)	**47.00**
HLN9133	VOX adapter for HMN9013	**40.00**
BDN6647	Med. weight headset with boom microphone (w/o VOX)	**114.00**
BDN6720	Flexible ear receiver w/o volume control	**35.00**

Retrofit kits for SP50:

DTMF retrofit kits are available for 2, 6 and 10 channel models. Includes keypad and encoder. (Standard Models Only) **50.00**

The **GP350** series is a synthesized, programmable portable available in 2 or 16 channel VHF and UHF models. The **GP350** is equipped with programmable frequencies, multiple private line or digital private line, programmable power output, programmable internal VOX, time-out timer and Quik Call II for paging. The 16 channel models include priority scan and signalling capabilities. The **GP350** meets MIL-STND 810 C, D & E and includes a high capacity nickel cadmium battery, standard rate desktop charger*, flexible antenna, belt clip, operator's manual and one year limited warranty.

VHF - 146-174 MHz

P83MGC20A2-A	5/1 wt, 2 ch	695.00
P83MGC20C2-A	5/1 wt, 16 ch, w/priority scan	828.00

UHF - 438-470 MHz

P84MGC20A2-A	4/1 wt, 2 ch 438-470 MHz,	745.00
P84YPC20C2-A	4/1 wt, 16 ch, 438-470 MHz, w/priority scan	878.00

OPTIONS:

(added to portables at time of order)

*H4376	Rapid rate desktop charger (omits standard rate charger)	39.00
H238G	Fully Approved Factory Mutual Intrinsically Safe Radio (includes Fully Approved 1200 mAH battery; omits standard battery)	95.00
H297B	DTMF keypad, 16 ch. models only	95.00
H867G	Omit standard rate charger	-10.00
H866G	2 year Express Service Plus (ESP) plan	29.00

Batteries & Chargers:

HNN9361	1200 mAH Fully Approved Factory Mutual Battery	165.00
HNN9360	1200 mAH Standard battery	83.00
HTN9630	Single unit rapid rate charger	65.00
HTN9702	Single unit standard rate charger	25.00
HTN9745	Six unit rapid rate charger	490.00
HLN9719	Vehicular charger adapter/bracket-12 volt (for use w/HTN9630)	45.00
HLN9944	Wall mounting bracket for multi-unit charger	19.00

BEARCOM
Wireless Worldwide

1-800-527-1670
Fax: 214-349-8950
or Call Your Local Branch Office Listed on Back Cover

Antennas:

HAD6502	Tunable antenna kit (146-174 MHz)	11.00
HAD9728	Tunable antenna kit (136-174 MHz)	10.00
HAD9742	VHF stubby antenna (146-162 MHz)	10.00
HAD9743	VHF stubby antenna (162-174 MHz)	10.00
NAE6483	UHF flexible antenna	11.00
NAE6521	UHF stubby antenna (400-440 MHz)	10.00
NAE6522	UHF stubby antenna (438-470 MHz)	10.00

Carrying Accessories:

HLN9417	Leather carry case with beltloop	51.00
HLN9323	Leather carry case with swivel	57.00
HLN9418	DTMF leather carry case with swivel	57.00
HLN9420	DTMF leather carry case with beltloop	51.00
HLN9416	Nylon carry case	24.00
HLN9965	Waterproof bag	36.00
NTN5243	Shoulder strap	17.00
HLN9724	2-1/2" belt clip	3.00
HLN8255	3" Spring clip	6.00

Audio & Signaling:

HMN9841	Remote speaker microphone (no adapter required)	75.00

Backward compatible with all GP300 audio accessories when used with the HLN9432 adapter.

HLN9432	Audio Accessory Adapter	15.00
HMN9727	Earpiece w/o volume control	25.00
HMN9752	Earpiece w/volume control	39.00
HMN9754	Surveillance microphone	114.00
HMN9767	Headset with swivel boom microphone	84.00
BDN6646	Ear microphone w/PTT interface	439.00
BDN6706	Ear microphone w/VOX interface	499.00
BDN6647	Headset w/boom microphone	114.00
BDN6648	Heavy-duty headset w/noise cancelling boom microphone	495.00

Service Related Accessories:

5880984Z01	Operator's manual	5.00
5880984Z07	GP350 Service manual	18.00

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing Letter to Peter Cowhey was sent by first-class mail, postage prepaid, this 15th day of August, 1997, to each of the following:

* Chairman Reed E. Hundt
Federal Communications Commission
1919 M Street, N.W., Room 814
Washington, D.C. 20554

* Commissioner James H. Quello
Federal Communications Commission
1919 M Street, N.W., Room 802
Washington, D.C. 20554

* Commissioner Rachelle B. Chong
Federal Communications Commission
1919 M Street, N.W., Room 844
Washington, D.C. 20554

* Commissioner Susan Ness
Federal Communications Commission
1919 M Street, N.W., Room 832
Washington, D.C. 20554

* Mr. Peter Cowhey
Chief, International Bureau
Federal Communications Commission
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Washington, D.C. 20554

* Mr. Thomas S. Tycz
Division Chief, Satellite &
Radiocommunication Division
International Bureau
Federal Communications Commission
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* Ms. Ruth Milkman
Deputy Bureau Chief
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